1 Needs Assessment/Requirements Analysis

What is needed…

1.1 Summary Findings from Needs Assessment Interviews

In order to fully understand the requirements for GIS from a broad number of stakeholders, this study commenced with a thorough and structured needs assessment interview process. The stakeholders interviewed included members of Maine state government, regional and municipal governments as well as the private sector and academic community. In total, over 65 individual interviews were conducted. This interview process was necessary to fully understand current GIS developments in Maine as well as the context for further development of the state's system.

Below, key findings from these interviews are summarized. These findings are grouped by finding type and were used to inform the development of the Coordination and Implementation Plan found in Section 2. These summaries aim to call out:

- Issues and problems that must be addressed
- The most intense unmet needs
- Factors that impact the context for statewide GIS expansion

The precise list of entities interviewed as well as a reference to the hundreds of pages of on-line, agency-by-agency summaries of need are found in Section 1.3.

1.1.1 Multiple Statewide GIS Initiatives

- Several organizations observed that Maine has multiple, significant GIS programs that tackle statewide data. The most significant of these at the state agency level include MeGIS (formerly State Office of GIS, or OGIS), DEP, DOT, DMR, DOC, DIF&W and PUC. Each of these is a strong, independent program and there is a high level of sophistication.
- These multiple entities share data and participate in some coordinating activities including the Maine GIS Executive Council. However, there remain some significant duplications of effort and data.
- There is no single source in Maine where one can obtain all of the best statewide data sets.
- Multiple participants observed that the current service level agreement funding mechanism of MeGIS hinders its ability to act as a strong statewide organization. It is difficult for MeGIS to exert authority, or even encourage collaboration and cooperation, when it is beholden to those it is trying to coordinate for funding support.

1.1.2 Education & Technical Assistance

- GIS is a common buzzword but many of those who stand to benefit by the technology don't know what it is. Many organizations have pursued GIS without

having clear objectives and expectations. Many groups had started initiatives but weren't sure what to do next.

- Numerous municipalities have GIS/automated data sets they are not taking advantage of. Multiple communities described having a "parcel composite" created in the 1990's that wasn't being used due to lack of knowledge about how to proceed.
- There is a huge need for education and outreach to help people understand and get people ready to begin GIS deployment. Common topics of suggested educational outreach included: cost and benefit information; instruction in data types and accuracies; surveys of GIS application availability; and, basic software use.

1.1.3 Needs for New Data

- The need for parcel data was widespread across all constituencies that were interviewed. People either wanted to create parcel composites or they had parcel composites that they were unable to use due to format (e.g. CAD) or inability to link with assessor's attribute information.
- Interest in aerial photos/imagery was widespread.
- Numerous municipalities mentioned an interest in school district data sets. These people were unaware of MeGIS school district data sets (see section 1.1.4, first bullet below)
- Multiple municipalities raised concerns about parcel updating going forward, even/especially when parcels exist digitally.
- Multiple parties mentioned that uniform statewide standards would help address problems that they faced. There was widespread frustration with handling parcel composites from multiple towns due to overlap issues at political boundaries, or having the data stored in different formats (e.g. CAD vs. GIS, different coordinate system, etc.). Many parties - especially state agencies and regional entities - were interested in assembling multi-town parcel composites to perform regional mapping and analysis.

1.1.4 Efficiency of MeGIS as a Statewide Repository

- Lots of people were unaware of how much data is available from MeGIS. Multiple participants mentioned interest in data that was available from MeGIS. There should be further active outreach and education to help people understand the importance and value of this resource (see 1.1.3, third bullet above).
- People mentioned operational issues in terms of getting data from MeGIS efficiently, in spite of MeGIS data availability via the web. Issues included:
    - MeGIS tiling system is cumbersome to deal with and requires significant post processing by data recipients to create locally seamless data.

- MeGIS data often needed to have coordinate transformations performed to be useful with locally developed data sets (i.e. ME State Plane data vs. MeGIS UTM)
- Many parties had slow Internet connections that hindered their ability to download what they wanted/needed.
- People reported a major annoyance with the current overlap between ortho images. This issue could be eliminated with some basic post-processing of the ortho images by MeGIS.
- People reported a significant "download overwrite" problem. This problem emanates from the fact that multiple files covering different areas have the same name on the MeGIS site. Hence when two of these files are downloaded, one overwrites the other. This could easily be addressed with some basic file naming adjustments.

- Multiple parties raised concerns about the lack of a "one-stop" location for getting all state GIS data. Currently, one might have to make requests to MeGIS, DEP, DOT and several others to get all relevant data sets for a region. This uses the requesters time, and it also implies that multiple state personnel are performing a duplicative data distribution task (see above). Simply put, why should MeGIS and DEP both need to distribute data? Why should a COG need to get data from multiple state agencies?
- Multiple parties described their own operational issues with sharing GIS data sets. It was suggested that MeGIS could potentially sponsor an accessible Web or FTP site where individual communities and/or Regional Councils could post data for others to obtain.

1.1.5 Software Licensing & Hardware Issues

- Interviews identified very large quantities of ESRI® software licenses. At first glance, these quantities appear more than adequate, especially with the need for desktop access to GIS potentially diminishing with increased use of Internet Map Servers (IMS) and web applications. Issues of transitioning to new ESRI® technologies, and replacing old applications with new architectures (e.g. Citrix® vs. IMS) will be cause for further reevaluation of Maine's licensing structure.
- At the same time, many local and regional entities complained about lack of access to GIS software, especially some of ESRI®'s higher-end tools such as ArcInfo®/ArcGIS™. The State could consider creating a pool of licenses that could be shared with local governments on a check-in/check-out basis, potentially distributed via Citrix®.
- Multiple participants mentioned that group purchasing of hardware and software would be beneficial. The State should investigate creating a "state blanket" mechanism for ESRI® software purchases, and potentially for peripheral equipment.
- Lack of large format plotting often mentioned as an issue.

- Internet connectivity is not necessarily high-bandwidth. While slower bandwidth may be manageable for web-based applications, it can be fatal for tasks such as downloading multiple orthophoto images. Many towns mentioned difficulties downloading MeGIS data because of slow speeds. This issue should be tracked and if municipalities are unable to address it, the state could potentially consider a program to facilitate bandwidth improvements.

1.1.6 Application Issues

- There was strong support for web-based applications
- Given difficulties in obtaining software or securing adequate training to make good use of existing software, it was suggested that consideration be given to MeGIS providing a "packaged" web-based viewing application and/or a desktop GIS viewer. This application could be provided to communities to help jump start GIS activity. If MeGIS hosted an application with baseline GIS functionality (e.g. find an address, zoom and pan, basic layer manipulation, list basic attributes), multiple municipalities could be provided an affordable entry point into GIS. The minimal investment would be the cost of creating (or adapting an existing data set into) a standards compliant parcel composite.

1.1.7 Funding

- The Portland Water District mentioned that they could potentially support co-funding some data development projects. Project of interest to this type of utility might include new orthophoto imagery and parcel composites for its service territories. This type of collaborative funding could be explored more broadly with other utilities.

1.1.8 Summary of Unmet Data Layer Needs

As part of the interviews and surveys conducted in this study, GIS users of all levels were asked to identify data layers that would most benefit their operations, yet which were not immediately available to them. More than 100 such data layers were identified. A small number of these are in fact available currently through the MeGIS data distribution system, but users were unaware of this or unable to access them. Among the layers that are not presently available, the most requested were property parcels, roads combining class information with address ranges, land use/land cover that accurately describing land utilization types, water and sewer utilities, zoning, conservation lands, and contours.

The table on the following page presents this data layer prioritization, itemized by the types of organizations that requested the data layers. The table sorts individual layers by the number of times they were requested during the interview and survey process. This number is indicated in the column in the extreme right-hand column.

Maine SPO Resolve 23 REQUESTED DATALAYERS LIST 1/24/2002 Highest Priority Layers Priority Layers Layer Name and Description	Towns and Cities	Maine Counties, Regional Agencies, Tribal Councils and Land Trusts	Maine State Agencies	Utilities	Educators	Federal Agencies, National Organizations	Private Companies and Consultants	Rating
PARCELS with Attribute Data	11	5	5	3			1	25
ROADS E-911 and DOT Data from MeGIS as combined layer	10	6	4			1		21
LAND USE Coverage/Data	4	3	5		1	1		14
UTILITIES Data Layers (water and sewer systems)	5	2	1	2				10
ZONING data, with standardized attributes	2	2	4	1			1	10
MeGIS Base Data (available through periodic, dependable updates)	2		3	1		2		8
Shoreland Zoning Data and Overlays	3	2	2				1	8
CONSERVATION Lands, Protected Open Space	3		3					6
CONTOURS (10' or better, including surrounding communities)	4	1	1					6
WATER Distribution System Data	4	2						6
ORTHOPHOTOS (digital)	1	1	3					5
School District Boundaries	4		1					5
Sewer and Drainage System Data	2	1	2					5
Endangered Species Locations	2	1	1					4
Digital Elevation Model Statewide	1		2					3
Growth Areas		2	1					3
Hydrography (Enhanced Streams)	1		2					3
Soils			3					3
Watershed Boundaries			2	1				3
Wetlands (higher quality than NWI)		1	2					3
County & Municipal Boundaries (no shorelines)		1	1					2
Deer Habitats	2							2
Demographics Data (Census or other)		1	1					2
Fish and Wildlife Data		2						2
Floodplain/Flood Hazard Data			2					2
ROW for Planning & Analysis				2				2
Septic System Locations	1		1					2
Slopes	1		1					2
Transportation Networks	1		1					2

Table 1-1: MOST REQUESTED DATALAYERS

Please note that the Private Companies and Consultants responses are limited due to the relatively low number interviewed and the fact that several of those contacted are more active producers of spatial data than consumers of them.

The full list of these data requests is included as **Attachment A.**

1.1.9 Summary of Unmet Application Needs

The interview and survey process also included questions about desired GIS and GIS-related applications. These varied widely, and again, included some that are presently being delivered by MeGIS and other agencies.

Among the most desired, there was a strong correlation with the requested data layers list. These include a consolidated E911 and classed DOT roads viewer, parcel viewer with abutters identification and notification tool, and an application to land use and aerial photography data.

There were also frequent requests for tools to manage GIS data, including a standard, statewide metadata management application that would quickly bring data sets into

compliance with the MeGIS and Federal Geographic Data Committee (FGDC) requirements.

Applications were organized into the following categories:

- **Data Management Tools.** These included applications to be used for organizing and integrating spatial data with the overall Maine GIS environment. They would be utilized for validating the quality of spatial data, indexing and cataloging data that exists, and assisting in the creation of specifications for contracting GIS work.
- **Data Viewers.** Generally these correspond to layer-specific requests for access to data. Some viewers, such as a tool for viewing information about specific Maine lakes or visualizing public water supply data are already available to the general public over the Web (see Attachment B). Many others, ranging from statewide orthophoto and wetlands viewers to insect infestation monitoring tools will require enhancements to underlying data before they are actualized.
- **Simple Analytical Tools.** More sophisticated than simple data viewers, this category of tools involves proximity or multi-layered analysis of spatial data. They include such applications as Census data analysis and property parcel abutter notification tools.
- **Complex Analytical Tools.** More sophisticated still are applications bringing large numbers of data layers and other tabular information sources together to perform analysis on land use and complicated infrastructure systems. This category includes such applications as buildout analysis and impervious surface modeling tools.
- **Integrated Hardware and Software Solutions.** Applications that involve real time vehicle location tracking and full integration of global positioning system data were also identified.

The full list of these data requests is included as **Attachment B**.

1.2 The Survey Database

1.2.1 The Survey Methods

In close collaboration with the Steering Committee, an 83-question survey was prepared as a vehicle for quickly assembling information on GIS requirements from a wide group of Maine GIS stakeholders. Distribution of the survey to Maine GIS users began in October, 2001. The survey was designed as both an accompaniment and complement to the personal interviews conducted as part of this project. Almost all interviewees filled out the survey as did many other entities that were not interviewed personally or by telephone. The survey was handed out in hard copy format at the Maine Municipal Association annual meeting as a means of obtaining the most possible feedback from as many cities and towns as possible. The results from hard copies that were returned were entered into an MS-Access database by MeGIS staff. In addition, the survey was placed

on-line on the Internet through the MeGIS web-site. On-line entries were automatically entered into the database, which was configured so as to enable thematic mapping of its contents.

This database remains active and respondents continue to add data. It may be accessed through the MeGIS Website at: http://apollo.ogis.state.me.us/sc/survey/scsurvey.asp .

The following categories of questions were asked and answered in the survey:

- Section 1: **General contact information**. This includes email and mail addresses to potentially be used for future contact and GIS community building.
- Section 2: **Issues that could be better addressed** in the respondent's community. Asks the respondent to prioritize on a scale of 1 – 5 which general issues (that GIS is traditionally useful in addressing) they would like to be able to do better.
- Section 3: **Existing GIS activity.** Asks specific questions about GIS use and familiarity.
- Section 4. **Technology infrastructure.** Addresses the software and network environment of respondents' geographic information systems.
- Section 5. **Data sharing and exchange.** Determines how GIS and other digital data moves in and out of the organization.
- Section 6: **Potential for state/regional assistance in GIS development.** Determines what funding, training or support roles that state or regional organizations could play in facilitating future GIS growth.
- Section 7: **General comments and ideas.** Solicits free form input from respondents regarding their experiences with GIS and what they feel could be done better.

A complete version of the survey is included in this report as **Attachment C**.

1.2.2 The Survey Results

1.2.2.1 Relevant facts gleaned from the survey

Responses to the survey were both filled out online and submitted in hardcopy to the Maine Office of GIS where their contents were entered into the database. Summary findings are drawn from analysis of the 83 questions on that survey. While the survey remains online and active, totals tabulated for this report were collected through January 22, 2002.

Responses at the time of this final tally totaled 234. Respondents were predominantly municipal officials, although entries were generated from all levels of government and the private sector. Municipal entries arrived from town managers (n=37), assessors and assistant assessors (n=22), selectmen, code enforcement officers, and clerks. Entries from other sectors included land trust directors, environmental scientists, librarians, company presidents and IT managers, epidemiologists and educators.

- There was wide familiarity with GIS, but it was not universal.
- Almost all were operating within the Microsoft Windows environment, though more than a dozen reported using GIS under a UNIX operating system.
- ESRI® software was ubiquitous, but additional entries included Autodesk (n = 6) and MapInfo (n = 4).
- Of respondents answering questions about speed of access to the Internet,
    - 21 reported T1 (> 1 Mbit/second) access
    - 17 reported DSL
    - 8 reported ISDN
    - More than 35 reported 56K or slower Dial up.
- Answers to questions about pressing issues that GIS could be used to solve are summarized in the following table:

GIS is a useful tool in addressing all of the following issues. Which of these issues do you feel could be better addressed in your community?	RESPONSE (n = 234)
Create and reproduce maps, that include information on aerial photographic imagery, zoning, topography, sewer and water lines, wetlands, etc.	66.3%
Update and reproduce tax maps, zoning maps and land use maps	63.9%
Provide detailed planning for efficient and sound land development	59.0%
Select optimal sites for locating businesses and other facilities	57.9%
Advance economic development	57.5%
Map road conditions and maintenance priorities	57.5%
Track and model the quality of ground and surface water	52.1%
Auotmate identification of abutters and addressing of envelopes for abutter notifications	52.1%
Track and manage residential and commercial growth	51.7%
Provide citizens with remote access to local government information	51.1%
Provide property maps quickly to tax payers and real estate professionals	51.0%
Dispatch and route emergency vehicles	49.8%
Track active building and septic system permits to aid in inspections	48.7%
Optimize preservation of farmlands	45.8%
Track depletion and recovery patterns of fisheries, forests, and soil erosion	44.5%
Track and model the spread of pollutants or destructive biological agents	43.6%
Optimize delivery of rural health and medical services	43.3%
Locate sites for telecommunication towers and cell phone facilities	42.6%
Identify hazardous waste sites and map brownfields	42.6%
Track and map buildings with fire code violations	42.6%
Map and analyze crime patterns	42.4%
Graphically identify locations of properties with tax liens by year	42.0%
Map the territories of animal and plant species	41.7%
Evaluate sites for waste disposal	38.5%
Evenly distribute classload burdens among schools and increase efficiency of school bus routing	37.4%
Track down power outage locations	36.9%
Provide asset management that could address GASB-34 requirements	36.8%

Table 1-2: SURVEY RESULTS: ISSUES

- Similarly, aggregated responses to questions about funding and state or regional assistance questions are included below:

What types of "state and/or regional" sponsored GIS support would be most valuable to your community/agency?	RESPONSE (n = 234)
Free GIS software	62.2%
Technical assistance	62.0%
Training opportunities	62.0%
Educational events and seminars	60.8%
Facilitated data distribution/sharing	59.9%
Sharing resources to support GIS data distribution & applications	57.0%
Facilitated group/blanket purchasing of equipment/software	54.8%
Creation of regional GIS service centers	52.0%
Development/promulgation of GIS standards	51.8%
Web-site hosting	48.3%
Cash/matching support >$10,000/town	40.3%
Cash/matching support of $5,000 - $10,000/town	40.1%
Cash/matching support of <$5,000/town	35.2%

Table 1-2: SURVEY RESULTS: ASSISTANCE

The fact that these response data are collected in a digital database facilitates mapping of trends. A sample of this is included below:

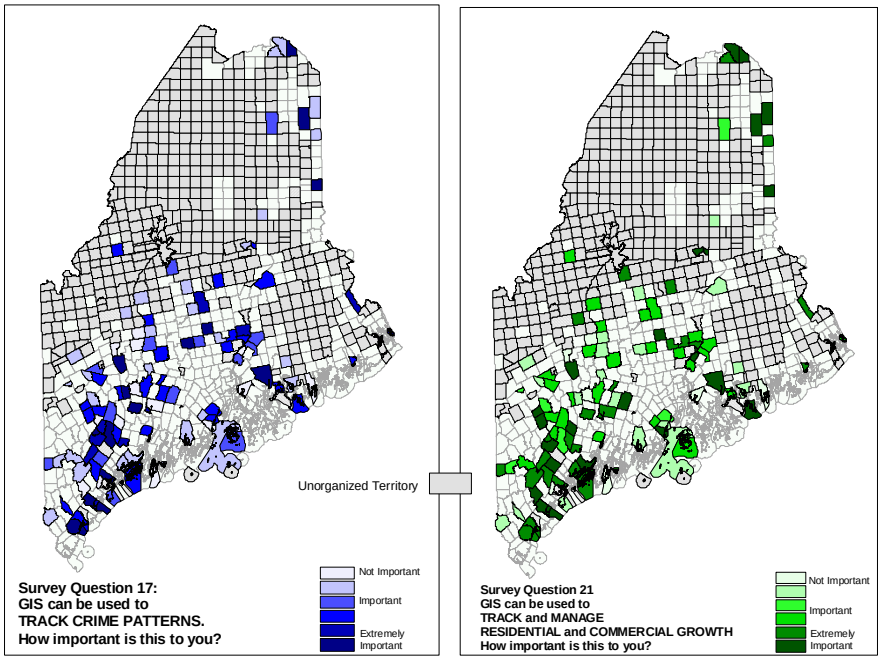

Figure 1-1: SURVEY RESULTS: CRIME & GROWTH

The complete database associated with this survey is included on a compact disk that will be made available through MeGIS. An ArcView® project file and necessary geographic data to graphically depict survey results are also included on this CD. Tabular data will be accessible with Microsoft Access, Excel or compliant software. Geographic data will require GIS software for viewing.

1.2.2.2 Maps showing entities in Maine that were contacted

The following pair of maps describes respondents' answers to questions relating to their familiarity and use of GIS. In the first it is apparent that the vast majority of municipal jurisdictions contacted had some familiarity with this technology. The second visually describes that far fewer are currently using this technology.

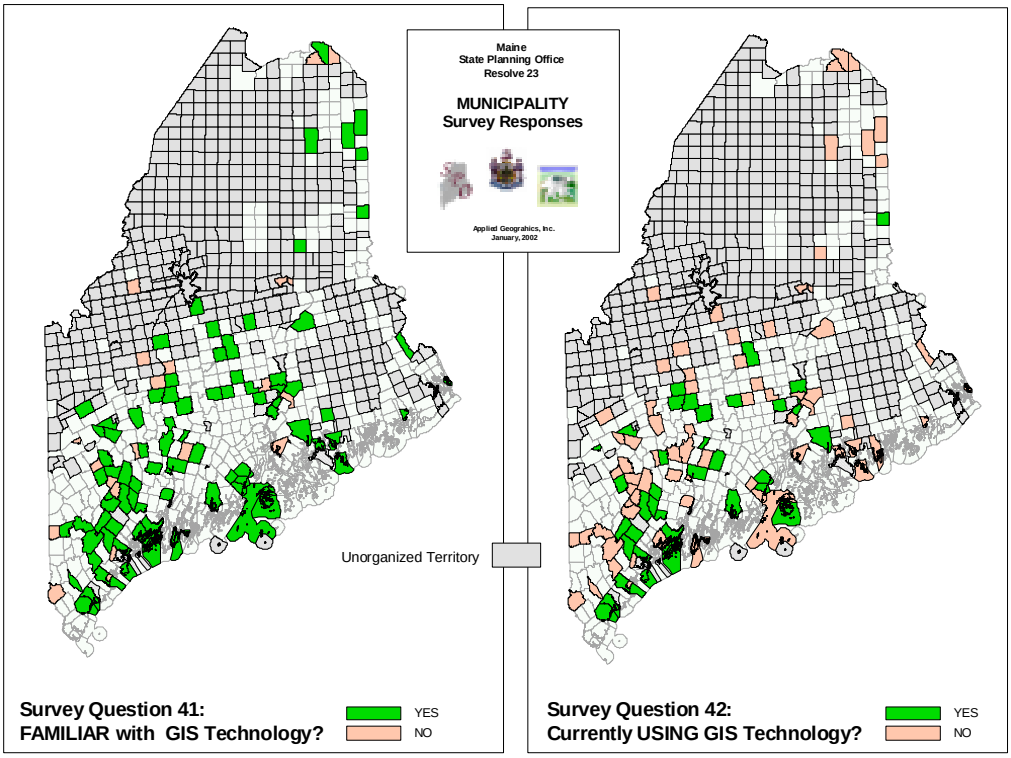

Figure 1-1: SURVEY RESULTS: GIS USE

1.3 Interview Write-ups

Nearly one hundred entities in seven different categories were interviewed either by phone or in person as part of the Maine Resolve 23 Needs Assessment. In most cases these involved site visits and observations of current working environments as well as demonstrations of applied technology. Duration of interviews typically lasted 1-3 hours, while some extended far longer and were even conducted over multiple days.

Detailed write-ups of these interviews typically include brief functional and GIS overviews, itemization of GIS data and resources, GIS applications currently being used or needed, planned GIS activities and most observable benefits of GIS within the organization or agency. Since the summaries of these interviews together total hundreds of pages of text, for purposes of economy these have been included in digital Adobe Portable Document Format (.pdf) as part of a compact disk that will be available from MeGIS. Additionally, they are available on-line at:

http://www.appgeo.com/clients/maine/

1.3.1 Interview Itemization

Interviews included the following:

Maine Towns and Cities

Arundel	Fort Fairfield	Saco
Bangor	Hampden	Sanford
Bar Harbor	Houlton	Skowhegan
Calais	Kennebunk	Waldoboro
Camden	Lewiston	Waterville
Carrabasset Valley	New Gloucester	Winthrop
Dover-Foxcroft	Oakland	
Ellsworth	Portland	

Maine Counties, Regional Agencies, Tribal Councils and Land Trusts

Androscoggin Valley Council of Governments
Eastern Maine Development Corporation
Land Trusts & Non-Profit Private Conservation Groups (focus group), including:
- Coastal Mountains Land Trust
- Freeport Conservation Trust
- Frenchman Bay Conservancy
- Lakes Environmenal Association
- Maine Audubon Society
- Maine Coast Heritage Trust
- Sheepscot Valley Conservation Association

Greater Portland Council of Governments
Hancock County Planning Commission
Island Institute
Kennebec Valley Council of Governments
Lincoln County Commissioner
Northern Maine Development Commission
Southern Maine Regional Planning Commission
Penobscot Indian Nation
York County EMA

Maine State Agencies
Department of Agriculture
Department of Conservation
Department of Defense, Veterans & Emergency Management
Department of Education
Department of Environmental Protection
Department of Human Services (Bureau of Health)
Department of Inland Fisheries and Wildlife
Department of Marine Resources
Department of Transportation
Economic Development (Focus Group), including:
- Department of Economic and Community Development
- Department of Labor
- Maine and Company
- Maine State Housing Authority
- Finance Authority of Maine
- Maine State Chamber of Commerce

Maine Historic Preservation Commission
Maine Office of Geographic Information Systems
Maine Public Utilities Commission
Maine State Archives
Maine State Chief Information Officer
Maine State Planning Office

Utilities
Portland Water District
Central Maine Power
Bangor Hydro
Utilities (Focus Group) including:
- Adelphia
- Maine Natural Gas
- Maine Public Service Company
- Portland Natural Gas Transmission Company
- Portland Pipe Line Corporation
- Verizon

Water Utilities & Sewer Districts (Focus Group), including:
- Augusta Water District
- Kennebunkport and Wells Water District
- Maine Rural Water Association
- Paris Utility District
- Portland Water District
- Winthrop Utilities District

Private Companies and Consultants
Engineers and Surveyors (focus group) including:

City of Portland Department of Public Works
Duke Engineering & Services
Maine Department of Transporation
Sebago Technics
Woodlot Alternatives

Realtors and Appraisers (focus group) including:
Central Maine Title Company
Verill & Dana LLP
Associated Builders & Contractors, Inc., Downeast Maine Chapter
Home Builders & Remodelers Association of Maine

James W. Sewall, Company
Plumb Creek Timber Company

Educators

Universities and Colleges (focus group) including:
Bates
Bowdoin
Unity College
University of Southern Maine
University of Maine at Farmington
Colby

University of Maine at Orono

Federal Agencies and National Organizations

Federal Emergency Management Agency
National Park Service: Acadia National Park
National Oceanic and Atmospheric Administration
US Fish and Wildlife Service
US Department of Agriculture, Natural Resources Conservation Services
US Geological Survey, National Mapping Program

1.3.2 Full Project Contacts

In addition to the formal interviews, a large amount of information was collected as part of conversations and electronic correspondence with GIS stakeholders elsewhere in the public and private sector. All told, input from more than 400 individuals was received during the course of data collection for this project. The complete list of contacts is included as **Attachment D.**